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A NEW SPECIES OF GADIFORM FISH, *BREGMACEROS HOUDEI*, FROM THE WESTERN NORTH ATLANTIC

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ABSTRACT

Bregmaceros houdei, new species, previously known as *Bregmaceros* Type A in several recent publications by E.D. Houde is described. This species is characterized by having 13–14 + 33–36 = 47–50 vertebrae, slightly lower myomere counts 44–47, 40–48 second dorsal fin rays, and 41–50 anal fin rays. Larval features are diagnostic and include a very early developing first dorsal fin ray at larval lengths of 2.0–2.5 mm. The pigmentation is unique with dark chromatophores located at the angle of the jaw and on the tip of the lower jaw, scattered over the hindbrain, on the first dorsal ray in larvae from 3–5 mm in length. Larvae from 5–10 mm in length have additional dark chromatophores scattered over the fore-, mid- and hindbrain, on the nape, on the first dorsal ray and pelvic fins, and on the ventral surface of the anterior half of the visceral mass in some but not all specimens. Juvenile specimens have dark chromatophores on the nape between the dorsal fins and extending down over the anterior visceral mass.

In the most recent treatment of the Bregmacerotidae, four species are recognized from the western Atlantic Ocean (Houde, 1984). Three of these species are described (*B. macclellandi* Thompson, *B. atlanticus* Goode and Bean and *B. cantori* Milliken and Houde) but the fourth was referred to as *Bregmaceros* Type A by Houde (1984). It is our privilege to describe *Bregmaceros* Type A and name it for Houde in recognition of the outstanding work he has done on this family (Houde et al., 1979; Houde, 1981; Milliken and Houde, 1984; Houde, 1984). The description of this new species is based on larval and juvenile forms as no adults are known to us. Possibly, it is a neotenic species. Adults of all species of *Bregmaceros* are very similar in appearance, but larval and juvenile forms are very distinctive.

Bregmaceros houdei[1] new species
Tables 1–3, Figures 1, 2

Bregmaceros Type A: Houde et al., 1979: 24–25, 66, 421–423, 528; Houde, 1981: 85–102 (description, illustration, distribution); Houde, 1984: 300–308 (description, illustration, relationships); Richards, 1984: 20 (distribution); Milliken and Houde, 1984: 17 (differentiation from congeners).

Holotype.—MCZ62920 juvenile 16.4 mm SL, Cruise 8C7113, Station 43, 25°00'N, 83°11'W, eastern Gulf of Mexico.

Diagnosis.—A species of *Bregmaceros* with 13–14 + 33–36 = 47–50 vertebrae; 40–48 second dorsal fin rays; 41–50 anal fin rays; distinctive larval features including an early developing first dorsal fin ray at 2.0–2.5 mm NL; unique larval and juvenile pigmentation of dark chromatophores at the tip and angle of the lower jaw, scattered over the hindbrain, on the first dorsal ray of 3–5 mm NL larvae; additional dark chromatophores scattered over the fore-, mid-, and hindbrain, on the nape, on the first dorsal and pelvic fins and on the ventral surface of the anterior half of the visceral mass of most larvae 5–10 mm SL. Juveniles

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[1] Dr. Houde's name is often mispronounced, so please note that the pronounciation of *houdei* is hood-eye and not how-dee-eye, who-dee-eye or hud-dee-eye.

Table 1. Morphometric data based on a size series of *Bregmaceros houdei* larvae and juveniles from the eastern Gulf of Mexico. (All measurements in mm with the predorsal length referring to the second dorsal fin origin and not the first free dorsal ray; dashed line indicates flexion)

Cruise–station	Length notochord or standard	Head length	Snout length	Eye diameter	Predorsal length	Prepelvic length	Head depth	Body depth	Interorbital width	Length of first dorsal ray	Pelvic fin length
IS7209–16	1.7	0.60	0.18	0.18	0.68	—	0.48	0.23	0.18	—	—
IS7308–50	2.0	0.60	0.25	0.25	0.90	—	0.60	0.25	0.18	—	—
8C7120–50	2.2	0.68	0.25	0.28	0.93	—	0.58	0.28	0.20	—	—
IS7308–50	2.4	0.68	0.30	0.25	0.83	—	0.55	0.25	0.18	—	—
IS7209–82	2.5	0.93	0.30	0.38	1.10	0.55	0.78	0.38	0.20	0.20	—
8C7120–50	2.5	0.85	0.38	0.30	0.90	0.58	0.75	0.30	0.20	0.35	—
8C7113–25	2.5	0.83	0.30	0.33	1.05	0.48	0.73	0.38	0.18	0.18	—
IS7308–34	2.7	0.85	0.30	0.25	1.00	0.70	0.95	0.45	0.18	0.50	—
8C7120–50	2.8	0.85	0.30	0.33	1.30	0.55	0.68	0.35	0.20	0.23	—
IS7303–67	3.0	0.85	0.33	0.30	1.38	0.75	0.85	0.35	0.25	0.30	—
IS7303–16	3.0	0.80	0.25	0.28	1.18	0.58	0.75	0.38	0.25	0.15	—
8C7120–58	3.0	0.88	0.30	0.28	1.38	0.58	0.83	0.45	0.25	0.30	0.33
IS7209–16	3.3	1.12	0.40	0.38	1.43	0.88	1.05	0.55	0.25	0.40	0.48
IS7308–50	3.5	1.15	0.45	0.38	1.88	0.95	0.93	0.40	0.28	0.75	0.28
IS7303–66	3.6	1.00	0.38	0.38	1.45	0.83	1.10	0.55	0.28	0.45	0.45
GE7117–81	3.9	1.15	0.33	0.43	1.75	0.70	1.10	0.60	0.33	0.80	0.80
8C7120–64	4.2	1.20	0.33	0.38	2.00	0.88	1.20	0.55	0.25	0.58	0.60
IS7303–98	4.4	1.13	0.30	0.38	1.75	0.85	1.13	0.65	0.30	0.48	1.10
8C7120–33	4.5	1.33	0.43	0.43	1.75	0.95	1.20	0.73	0.38	0.45	0.90
IS7209–34	4.9	1.58	0.53	0.50	2.23	0.85	1.33	0.80	0.40	0.70	1.10
8C7120–33	5.2	1.75	0.68	0.45	2.55	1.05	1.40	0.95	0.43	1.00	1.20
IS7209–34	5.5	1.75	0.63	0.43	2.55	1.05	1.30	0.78	0.43	0.85	1.20
8C7113–81	5.8	1.40	0.33	0.40	2.60	0.90	1.38	0.90	0.35	0.90	1.65
8C7120–58	6.1	1.50	0.55	0.50	2.60	0.88	1.33	0.88	0.45	0.95	1.50
IS7209–82	6.4	1.75	0.55	0.48	2.80	1.25	1.38	0.93	0.35	0.55	0.45
IS7209–16	6.5	1.90	0.58	0.55	2.58	1.13	1.50	1.00	0.40	1.10	2.23
IS7209–16	6.8	1.83	0.45	0.55	3.10	1.13	1.68	1.03	0.45	0.90	2.20
IS7303–16	7.0	1.93	0.58	0.55	3.00	1.30	1.63	1.08	0.38	1.70	1.88
8C7113–25	7.7	1.88	0.55	0.48	3.30	1.20	1.70	1.15	0.40	1.50	2.20
8C7113–43	8.2	2.00	0.55	0.63	3.50	1.40	1.58	1.12	0.45	1.70	2.80
8C7113–81	8.4	2.05	0.80	0.53	3.60	1.30	1.80	1.23	0.38	1.40	2.50
8C7113–74	9.0	2.08	0.75	0.50	4.20	1.75	1.80	1.25	0.38	2.00	3.30
8C7113–33	9.2	2.00	0.60	0.50	3.70	1.50	2.00	1.30	0.40	1.20	3.40
8C7113–33	10.2	2.50	0.70	0.50	4.30	1.50	1.90	1.30	0.40	2.20	3.50
8C7113–75	10.3	2.63	0.78	0.65	4.20	1.50	2.00	1.50	0.50	1.70	3.80
8C7320–50	10.5	2.43	0.65	0.58	4.60	1.50	1.93	1.68	0.50	2.00	4.00
8C7113–75	11.0	2.60	0.80	0.63	4.20	1.63	1.88	1.65	0.50	3.00	4.30
IS7320–82	11.5	2.70	0.90	0.60	5.20	2.00	2.40	1.50	0.50	1.90	4.00
8C7113–59	12.4	2.63	0.78	0.68	5.20	1.95	2.00	1.83	0.75	2.40	5.30
IS7320–82	13.6	3.10	0.90	0.70	5.60	2.00	2.30	1.80	0.70	2.40	4.80
8C7113–43	16.4	3.50	0.93	0.70	4.20	1.90	2.40	2.20	0.70	3.10	5.50

with dark chromatophores on the nape between the dorsal fins and extending down over the anterior visceral mass.

Description.—Morphometric data for a size series of 41 larvae and juveniles ranging in length from 1.7 mm NL to 16.4 mm SL are given in Table 1. Meristic data for a size series of 29 cleared and stained larvae and juveniles ranging in length from 4.1 mm NL to 16.4 mm SL are given in Table 2. A size series of 6 larvae and juveniles ranging in length from 2.0 mm NL to 16.4 mm SL are

Table 2. Meristic data based on a size series of cleared and stained *Bregmaceros houdei* larvae and juveniles from the eastern Gulf of Mexico. (Asterisk indicates damaged structure)

		Vertebrae			Second dorsal fin rays			Anal fin rays			Caudal fin rays			
Cruise—station	SL	Pre-caudal	Caudal	Total	First	Second	Total	First	Second	Total	Principal	Upper	Lower	Total
IS7209—16	4.1	—	—	34	—	—	—	—	—	—	—	—	—	—
8C7113—90	4.6	14	22	36	—	—	—	—	—	—	—	—	—	—
IS7209—16	5.1	14	33	47	—	—	6	—	—	9	—	—	—	—
IS7209—16	5.4	13	35	48	10	9	19	12	10	22	8	5	4	17
IS7209—16	5.7	14	34	48	12	11	23	11	9	20	8	5	5	18
8C7113—81	5.8	14	35	49	11	10	21	14	18	32	8	2	2	12
IS7209—16	5.9	14	34	48	12	14	26	13	16	29	8	6	6	20
IS7209—16	6.0	14	35	49	11	12	23	13	15	28	8	5	5	18
8C7113—90	6.3	14	33	47	10	12	22	11	10	21	8	6	5	19
8C7113—90	6.8	14	35	49	11	9	20	14	12	26	8	4	4	16
8C7113—90	6.8	14	34	48	10	12	22	15	17	32	8	4	6	18
IS7209—16	7.0	14	34	48	13	12	33	16	22	38	8	9	9	26
8C7113—90	7.1	14	34	47	10	15	25	10	15	25	8	8	8	24
8C7113—90	7.3	14	34	48	10	12	22	15	17	32	8	4	6	18
8C7113—90	7.3	14	34	48	12	13	25	11	12	23	8	5	5	18
8C7113—90	7.8	14	34	48	11	16	27	15	19	34	8	9	8	25
IS7209—16	7.8	13	34	47	15	24	39	—	—	40	8	11	11	30
IS7209—16	7.9	14	35	49	15	18	33	17	*	—	8	10	10	28
IS7209—16	8.1	14	34	48	14	26	40	—	—	44	8	11	11	30
IS7209—16	8.4	13	35	48	15	24	39	—	—	42	8	11	11	30
8C7113—90	8.5	14	34	48	12	28	40	16	25	41	8	6	6	20
8C7113—65	9.3	14	36	50	*	26	*	—	—	44	*	*	*	*
8C7113—50	9.8	14	35	49	15	*	*	—	—	49	*	*	*	*
8C7113—65	10.2	14	36	50	*	*	*	*	*	*	8	12	11	31
IS7320—50	10.5	14	34	48	—	—	45	—	—	46	8	13	12	33
8C7113—75	12.3	14	34	48	—	—	46	—	—	46	8	13	12	33
8C7113—90	13.2	14	34	48	12	28	40	16	25	41	8	6	6	20
8C7113—50	16.3	14	35	49	—	—	48	—	—	50	*	*	*	*
8C7113—43	16.4	14	35	49	—	—	47	—	—	47	8	13	12	33

illustrated in Figures 1 and 2. Larvae have short guts, large heads and large distinct pectoral fins. As development proceeds the single free dorsal ray appears at small sizes (2.0–2.5 mm NL). At about sizes of 5.0 mm NL the second dorsal and anal fins appear. There are two centers of development in each of these fins (Table 2 and Fig. 1C) but in later development at about 10 mm SL the distinction is lost. Perusal of the morphometric data in Table 1 shows some inconsistencies from what would be expected uniform growth. These inconsistencies are due in part to preservation artifacts and because length may not necessarily be coordinated with age. Inconsistencies also appear in the meristic data (Table 2). For example, the 7.1 mm SL specimen has fewer dorsal and anal rays developed than smaller specimens. The 7.1 mm specimen may be a younger specimen which did not shrink as much in preservation as did smaller though older specimens.

Pigmentation.—Among smaller (1.7–3.5 mm SL) *B. houdei* larvae, pigmentation was unique and characteristically different from larvae of other species of *Bregmaceros* which commonly occur in the Gulf of Mexico (Houde, 1981). *B. houdei* larvae have large, stellate, dark chromatophores on the hindbrain and over the nape at the base of the occipital ray (D_1). In our material, pigment on the nape was occasionally diffuse, though always present (Fig. 1). The midbrain in 2.5–5.0 mm SL larvae was usually covered with one or two large dark chromatophores but in larger larvae (5–10 mm SL) there was considerable pigmentation on both

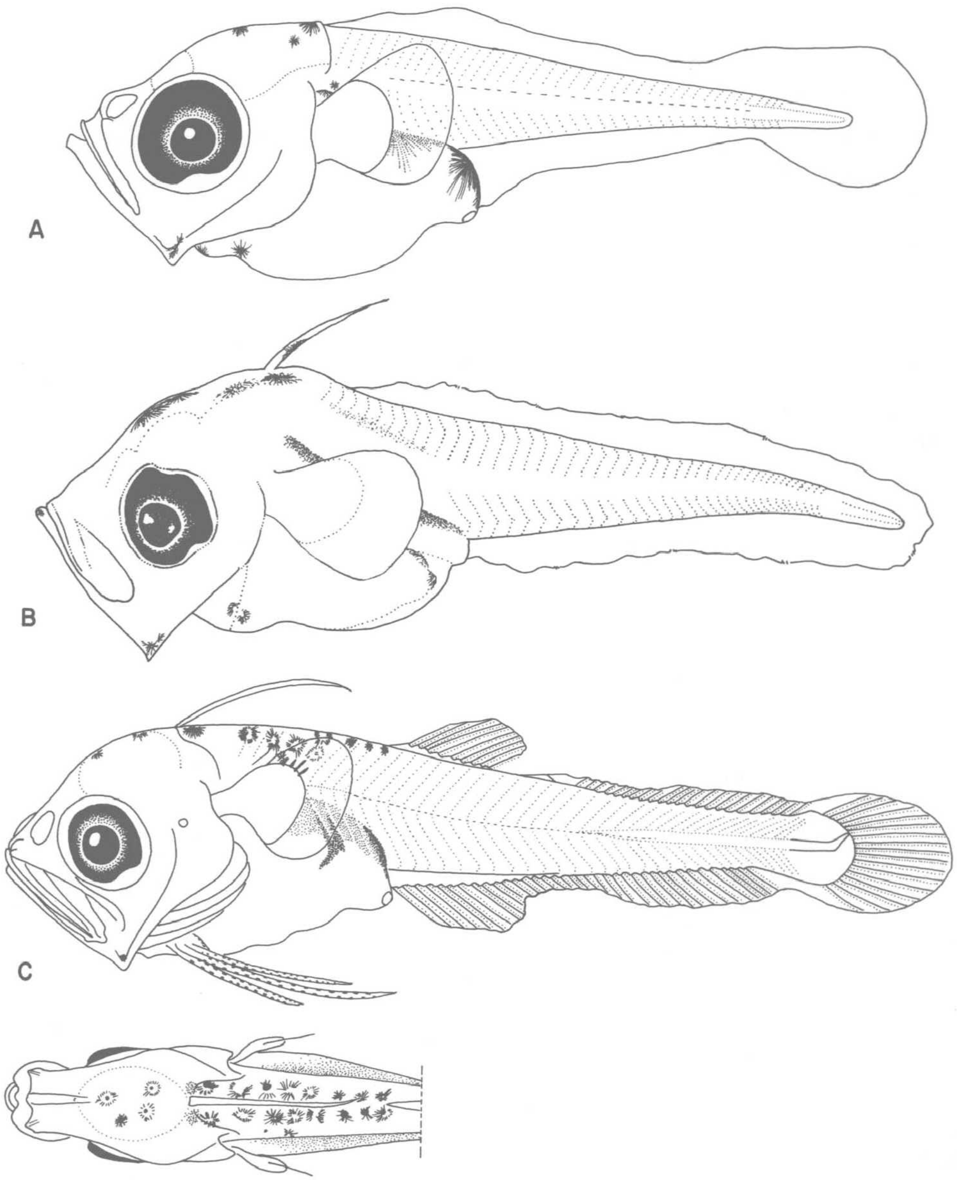

Figure 1. *Bregmaceros houdei* new species. (A) 2.0 mm NL, ISELIN 7708, Eastern Gulf of Mexico; (B) 3.1 mm NL, figure 153C from Houde 1984, 26°00'N, 083°53'W; (C) 5.8 mm SL 8C7113 Sta. 81, 27°00'N, 84°05'W, with dorsal view of head and nape.

the hind- and the midbrains. By 13.6 mm SL, there were additional dark chromatophores above the eyes. In larvae of 1.7–7.0 mm SL, there was usually a single, small, dark chromatophore at the angle of jaw which in some individuals was present only on the left side. At times, this jaw angle pigment was very difficult to see because of the extreme contraction of the chromatophore. In larvae longer than 7.0 mm SL, pigment at jaw angle was absent. All larvae had internal, diffuse, pigment on the dorsal border of the visceral mass and some had additional internal

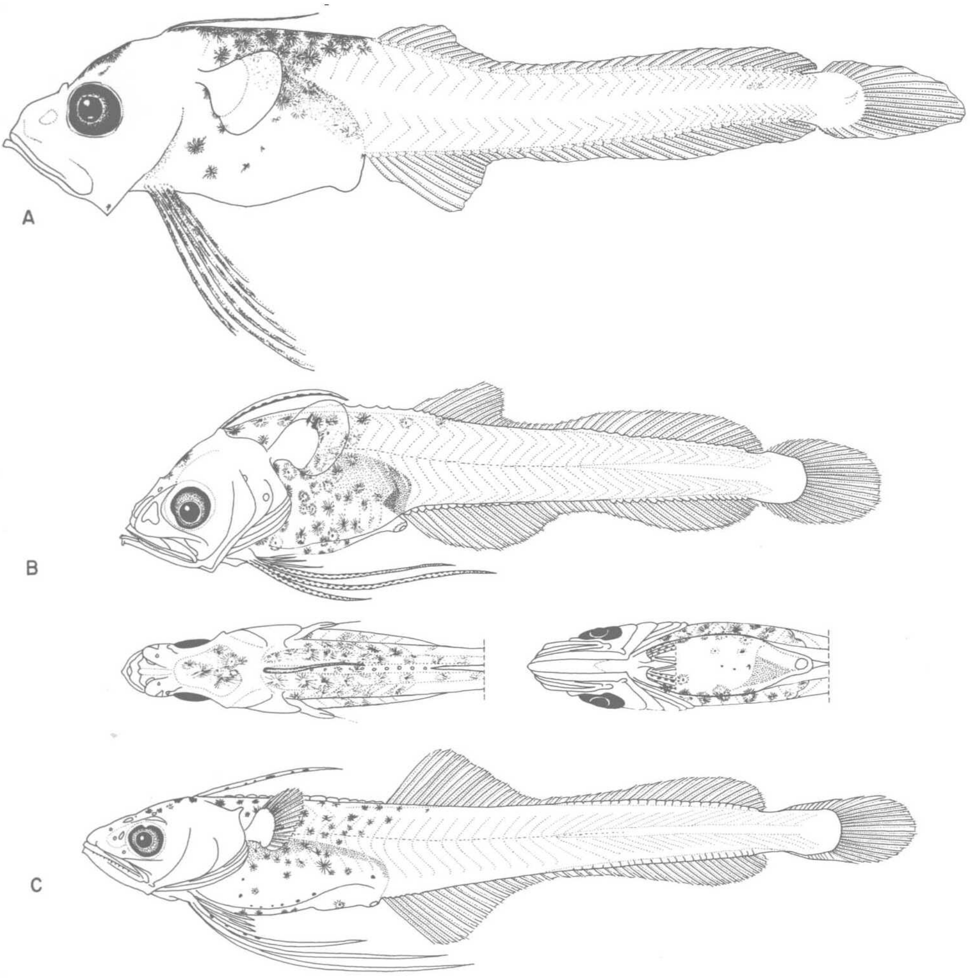

Figure 2. *Bregmaceros houdei* new species (A) 8.5 mm SL GE7101 Sta. 1, figure 55C from Houde, 1984, 27°00'N, 084°22'W, (B) 10.5 mm SL IS7320 Sta. 50, 26°00'N, 83°44'W, with dorsal and ventral views of anterior end; (C) 16.4 mm SL (holotype) 8C7113 Sta. 43, 25°00'N, 83°11'W.

pigmentation either along the anteroventral or the ventral edge of the gut. Pigment was not seen on the tip of the lower jaw in our specimens although it has been reported to be present by Houde (1984) on 2.0 to 2.5 mm SL larvae. Perhaps this chromatophore had faded in our material.

Pigment on the nape at the base of the occipital ray began to be extended posteriorly on the dorsolateral edge of the trunk (3.9 mm SL) by addition of a series of dark chromatophores arranged in a row. These rows of spots, on either side of the midline, reached the origin of the second dorsal fin by 5.0 mm SL and beyond to the sixth ray around 10.0 mm SL. A few, scattered, dark chromatophores appeared ventral to the rows on the upper dorsum beginning at 6.0 mm SL and continued to increase in number ventrally towards the visceral mass as the larvae grew older. By 8.0 mm SL, additional dark chromatophores had become concentrated covering the dorsal half of the visceral mass like a saddle. In larvae

Table 3. Comparison of meristic characters of western Atlantic *Bregmaceros*. Data on *Bregmaceros* from Fahay and Markle (1984); data on myomeres and fin rays from non-cleared and stained specimens from Houde (1984)

Taxon	Myomeres	Vertebrae			Second dorsal fin rays	Second dorsal fin rays (C&S)	Anal fin rays	Anal fin rays (C&S)
		Precaudal	Caudal	Total				
Bregmaceros	—	13–14	32–42	43–59	34–65	—	42–69	—
B. macclellandi	52–59	14–15	43–44	58	57–65	60	58–69	65
B. atlanticus	50–55	14	39–41	53–55	47–56	49–53	49–58	54–57
B. cantori	45–48	14	35	49	45–48	46	45–49	47
B. houdei	44–47	13–14	33–36	47–50	40–44	45–48	41–46	46–50

longer than 10.0 mm SL, pigment had expanded to cover the entire visceral mass laterally. Frequently, a few, scattered, melanophores were present on the ventral surface of the gut (longer than 5.0 mm SL) and in one specimen (8.2 mm SL) there was, also, some pigment at the pelvic fin insertion. Pigment appeared in the first dorsal ray at inception.

Comparisons.—As shown by Houde (1981; 1984) the four species of western Atlantic *Bregmaceros* are easily separated in the larval and juvenile stages. Meristic features separate adults. In Table 3 we provide additional data to that of Houde (1984). Houde had slightly lower myomere counts than the vertebral counts we obtained from cleared and stained material. The anterior vertebrae are arched and tightly compacted which is the reason for the lower myomere counts since anterior myomeres are difficult to discern. Houde's fin ray counts were also lower than ours obtained from cleared and stained specimens. In some of our specimens the last dorsal and anal pterygiophores were present but rays were not discernable. Our counts slightly extend the ranges of precaudal vertebrae and anal fin rays from those provided for the genus by Fahay and Markle (1984). We also compared the insertions of dorsal and anal pterygiophores among the four western Atlantic species based on one specimen of each of *B. macclellandi* 14.7 mm SL, *B. atlanticus* 9.0 mm SL, and *B. cantori* 12.0 mm SL, and two *B. houdei* 16.4 and 10.5 mm SL. *B. houdei, B. cantori* and *B. macclellandi* all had the first three anal pterygiophores inserted in front of the first haemal spine but only two anal pterygiophores were inserted before the first haemal spine of *B. atlanticus*. Generally two of the anterior dorsal and anal pterygiophores insert between the interneural and interhaemal spaces of vertebrae 15 to 25 whereas one or two inserts between the posterior interneural and interhaemal spaces of vertebrae 26–40+. The pattern in most cases is if one dorsal pterygiophore inserts in an interneural space then two anal pterygiophores insert on the same interhaemal space and in the next space it would be 2 dorsal and one anal inserting. Not enough specimens were available to determine individual variation in these counts.

Relationships.—No additional information is available to add to the tentative conclusion reached by Houde (1984).

Distribution.—*B. houdei* have been collected in the eastern Gulf of Mexico generally over the deep shelf and slope most often with larvae and juveniles of *B. atlanticus* (Houde, 1981). Few larvae were taken in stations >50 m deep. Richards (1984) found only a few larvae of *B. houdei* in the Caribbean Sea located at three stations on a transect on west longitude 63° between 15° and 17° north latitude to the west of the Lesser Antilles. These collections were made in the summer and larvae of *B. macclellandi* and *B. atlanticus* were also taken at these same stations.

Material Examined.—All designated paratypes. Location data for cruises IS (R/V COLUMBUS ISELIN), 8C (R/V DAN BRAMAN), or GE (R/V GERDA) are listed in Houde et al. (1976). Museum abbreviations are: MCZ—Museum of Comparative Zoology, Harvard; USNM—United States Museum of Natural History; UF—Florida State Museum, Gainesville; AMNH—American Museum of Natural History, New York; LACM—Los Angeles County Museum; and ANSP—Academy of Natural Sciences, Philadelphia.

MCZ62941	GE7117	Sta. 81:1 (3.9 mm NL) 27°00'N, 84°05'W.
MCZ62942	IS7209	Sta. 34:2 (4.9–5.5 mm SL) 25°30'N, 84°14'W.
MCZ62943	8C7113	Sta. 33:2 (9.2–10.2 mm SL) 25°30'N, 83°40'W.
MCZ62944	8C7113	Sta. 43:1 (8.2 mm SL) 25°48'N, 83°50'W.
USNM276346	IS7209	Sta. 16:16 (1.7–7.1 mm SL) 25°00'N, 83°44'W.
USNM276347	IS7209	Sta. 16:11 (4.1–8.4 mm SL) 25°00'N, 83°44'W (cleared and stained).
USNM276348	8C7113	Sta. 59:1 (12.4 mm SL) 26°15'N, 84°02'W.
USNM276349	8C7113	Sta. 25:1 (7.7 mm SL) 25°15'N, 83°34'W.
USNM276350	8C7113	Sta. 74:1 (9.0 mm SL) 26°45'N, 83°58'W.
UF43332	8C7113	Sta. 90:10 (4.6–13.2 mm SL) 27°15'N, 84°05'W (cleared and stained.
UF43333	8C7113	Sta. 81:1 (8.4 mm SL) 27°00'N, 84°05'W.
UF43334	8C7113	Sta. 81:1 (5.8 mm SL) 27°00'N, 84°05'W (cleared and stained.
UF43335	IS7320	Sta. 50:1 (10.5 mm SL) 26°00'N, 83°44'W (cleared and stained).
UF43336	IS7209	Sta. 82:2 (2.5–6.4 mm SL) 27°00'N, 84°22'W.
AMNH57000	8C7113	Sta. 50:2 (9.8–16.3 mm SL) 26°00'N, 83°55'W (cleared and stained).
AMNH57001	IS7308	Sta. 50:3 (2.4–3.5 mm NL) 26°00'N, 83°53'W.
AMNH57002	IS7303	Sta. 66:1 (3.6 mm NL) 26°30'N, 84°08'W.
AMNH57003	8C7120	Sta. 64:1 (4.2 mm NL) 26°30'N, 83°34'W.
AMNH57004	IS7303	Sta. 98:1 (4.4 mm NL) 27°30'N, 84°37'W.
LACM44135-2	8C7113	Sta. 75:2 (10.3–11.0 mm SL) 26°45'N, 84°15'W.
LACM44135-1	8C7113	Sta. 75:1 (12.3 mm SL) 26°45'N, 84°15'W (cleared and stained).
LACM44136-1	8C7120	Sta. 50:3 (2.2–2.8 mm NL) 26°00'N, 83°54'W.
LACM44137-1	8C7113	Sta. 25:1 (2.5 mm NL) 25°15'N, 83°34'W.
LACM44138-1	IS7308	Sta. 34:1 (2.7 mm NL) 25°30'N, 84°14'W.
ANSP157988	IS7303	Sta. 67:1 (3.0 mm NL) 26°30'N, 84°43'W.
ANSP157989	IS7303	Sta. 16:2 (3.0–7.0 mm SL) 25°00'N, 83°44'W.
ANSP157990	8C7120	Sta. 33:2 (4.5–5.2 mm SL) 25°30'N, 83°40'W.
ANSP157991	8C7120	Sta. 58:2 (3.0–6.1 mm SL) 26°15'N, 83°44'W.
ANSP157992	8C7113	Sta. 65:2 (9.3–10.2 mm SL) 26°29'N, 83°51'W (cleared and stained).

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